ESPC or Appropriations: Which is the most economical for federal energy conservation projects?

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Numerous differences between ESPC and Appropriations

- ESPCs incur interest charges
- ESCOs charge markups
- But it often takes longer to put an ECM in place using appropriations
  - *Agencies wait for Congressional appropriations*
  - *Agency competitive processes to allocate funds to sites cause delays*
  - *Inefficient equipment remains in service during this competition*
- Comparison requires careful analysis

Objective of this study

- Develop a representative energy conservation project
- Determine the life cycle cost of funding this project with
  - Appropriations (based on experience with an appropriations-funded program)
  - ESPC (based on experience with FEMP Super ESPC)

Developing a representative energy conservation project

- Used database of FEMP Super ESPC projects to determine:
  - Average implementation price
  - Average energy and energy-related O&M savings
  - Other financial parameters (O&M costs, M&V costs, etc.) that apply to ESPC

Modeling the ESPC process

- Used database of FEMP projects to determine
  - Process delays (kickoff to DO award, DO award to end of construction)
  - Average project interest rate
  - Average financing procurement price
  - Average performance period expenses
    - M&V (year-1 and escalation rate)
    - O&M/R&R (year-1 and escalation rate)

Financial and time-related parameters for the average Super ESPC project

1. Average time to DO award	15 months
2. Average design/construction period	12 months
3. Average implementation price	$3,263,000
4. Average financed amount	$2,990,000
5. Average pre-performance-period payment	$509,000
6. Average financing procurement price	$236,000
7. Average project interest rate	8.07%
8. Average delivery order term	206 months
9. Average first-year guaranteed cost savings	$354,000
10. Average escalation rate for guaranteed annual cost savings	1.87%
11. Average first-year M&V price	$13,300
12. Average escalation rate for annual M&V price	3.78%
13. Average first-year performance-period price, excluding M&V	$36,400
14. Average escalation rate for annual performance-period price, excluding M&V	3.95%
15. Average percentage of guaranteed cost savings paid to ESCO	98%
16. Average escalation rate for annual contractor payment	1.87%

Modeling the process of obtaining appropriated funds

- Used a database of appropriations-funded projects at one government site to determine:
  - Steps required to obtain funding
  - Average delays
  - Costs associated with each step in the process

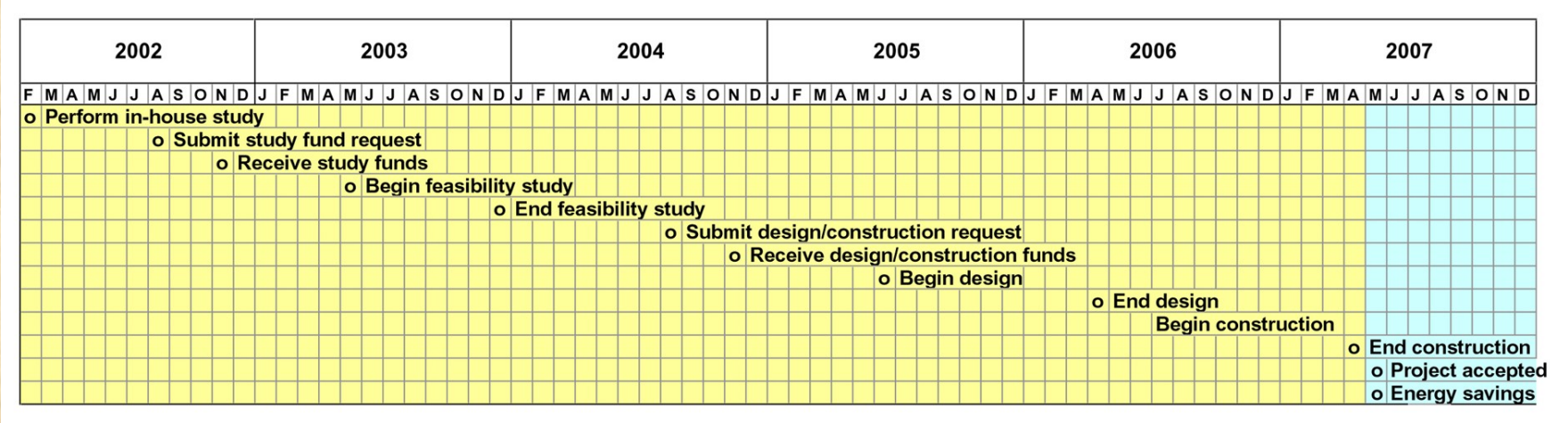
Funding energy conservation projects with the appropriations-funded program

- Preliminary assessment of ECM
- Develop/submit request for formal survey/feasibility study funds
- If funding received: perform survey and feasibility study (requiring 30% design)
- If payback 3-5 years, develop/submit request for design and construction funds
- If funds received, complete design and bid package, get bids, select bidder, construct project
- Accept project (and begin energy savings).

Database of projects at one site receiving funds in FY94/95

- Cost of feasibility study
- Date feasibility study began
- Date feasibility study ended
- Cost of design and construction
- Date construction eventually began
- Date construction ended

Used average delays for each step to develop a schedule for appropriations-funded process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o Perform in-house study
o Submit study fund request
o Receive study funds
o Begin feasibility study
o End feasibility study
o Submit design/construction request
o Receive design/construction funds
o Begin design
o End design
Begin construction
o End construction
o Project accepted
o Energy savings

Did it really take 63 months to get a project installed?

- According to the experience of this site -- as documented in their records -- it did
- Requests sometimes had to be submitted multiple times before design/construction funds were eventually received
- Frequent delays in the August/November request/funding cycle
- Site engineers were not surprised at the average delay, given their experience

Database also showed feasibility studies were a significant cost

- $1,251,000 received for feasibility studies (39 ECMs, $27.5 million design/construction cost)
- $4,996,000 received to fund design and construction of just 12 of the 39 ECMs
- Cost of feasibility studies for *constructed* ECMs was $195,000 -- 4% of *their* construction costs
- But in reality, feasibility studies cost 25% of design and construction costs

Financial parameters of the appropriations experience case

- Project cost equals Super ESPC **average implementation price**
- Until ECMs are accepted, site incurs a cost equal to the **average guaranteed cost savings**
- After acceptance, site incurs O&M costs equal to **average performance period price, excluding M&V**
- Salvage value according to straight-line depreciation
- 20 year study period
- 2.7% general price inflation, 6.1% discount rate, other escalation rates as per database

Costs incurred in appropriations-funded project (experience case)

Description	Base year cost	Annual escalation rate	Cost type	Month(s) in which cost occurs
Energy and energy-related costs	$29,500	1.87%	monthly	1–63
Perform in-house pre-feasibility study	$2,000	2.70%	one-time	1
Submit feasibility study funds request	$600	2.70%	one-time	7
Provide feasibility study funding	$815,750	2.70%	one-time	10
Submit design/construction funds request	$600	2.70%	one-time	31
Provide design/construction funding	$3,263,000	2.70%	one-time	34
Operations/maintenance/repair/replacement	$3,033	3.95%	monthly	64–240
Salvage*	($1,002,986)	n/a	one-time	240

*Salvage value is in year-20 dollars (i.e., at month 240).

Funding the representative project with an ESPC

- Project cost again equals Super ESPC **average implementation price**
- Agency reimburses DOE for PF upon NOITA 3 months after kickoff
- ESCO obtains financing for **average financed amount**
- Until ECMs are accepted, site incurs a cost equal to the **average guaranteed cost savings**
- At acceptance, site pays ESCO the **average pre-performance-period payment**
- During performance period, site pays 98% of guaranteed savings to ESCO

Funding the representative project with an ESPC (continued)

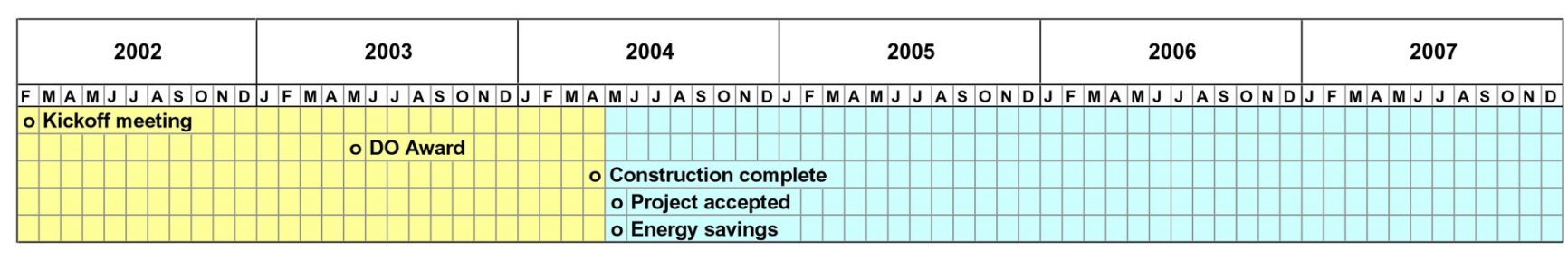
- During performance period ESCO uses payment for:
  - Interest (at **average project interest rate**)
  - M&V (at **average M&V price**)
  - O&M/R&R at **average performance-period price, excluding M&V**
  - Remainder goes to pay off principal
- After performance period, site pays for O&M/R&R
- Salvage value according to straight-line depreciation
- 20 year study period
- 2.7% general price inflation, 6.1% discount rate, other escalation rates as per database

Costs incurred for ESPC-funded project

Description	Base year cost	annual escalation rate	Cost type	month(s) in which cost occurs
Energy and energy-related costs	$29,500	1.87%	monthly	1–27
Project facilitation fee	$30,000	2.70%	one-time	3
Buydown	$509,000	2.70%	one-time	28
Contractor payment	$28,910	1.87%	monthly	28–226
Operations/maintenance/repair/replacement	$3,033	3.95%	monthly	227–240
Salvage*	($405,099)	n/a	one-time	240

*Salvage value is in year-20 dollars (i.e., at month 240).

Schedule for ESPC-funded project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o Kickoff meeting
o DO Award
o Construction complete
o Project accepted
o Energy savings

We also modeled a "best case" appropriations scenario

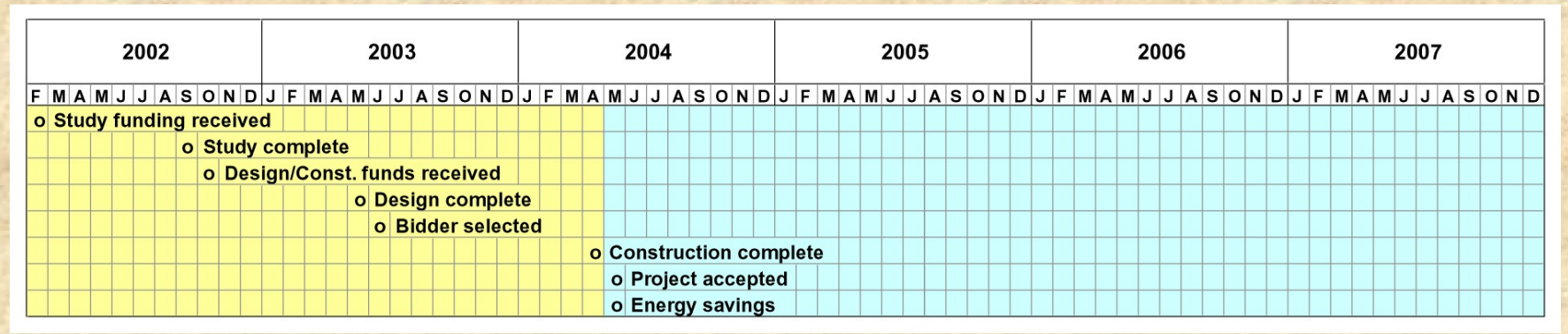
- All feasibility studies lead to built projects, so study costs are 4% of design/construction costs, not 25%
- Delay to acceptance is 27 months (same as in ESPC), rather than 63 months
- Other costs and escalation rates same as in appropriations experience case

Costs incurred in appropriations-funded project (best case)

Description	Base year cost	Annual escalation rate	Cost type	Month(s) in which cost occurs
Energy and energy-related costs	$29,500	1.87%	monthly	1–27
Provide feasibility study funding	$127,257	2.70%	one-time	1
Provide design/construction funding	$3,263,000	2.70%	one-time	9
Operations/maintenance/repair/replacement	$3,033	3.95%	monthly	28–240
Salvage*	($405,099)	n/a	one-time	240

*Salvage value is in year-20 dollars (i.e., at month 240).

Schedule for “best case” appropriations project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o Study funding received
o Study complete
o Design/Const. funds received
o Design complete
o Bidder selected
o Construction complete
o Project accepted
o Energy savings

Results of the study

Cost breakdown for ESPC case

Expense	Constant dollar cost (PV)		Current dollar cost	
Energy/energy-related O&M before ESPC	$758,417	15.4%	$813,963	10.0%
Pre-performance period payment	$469,956	9.5%	$541,646	6.7%
Project facilitation costs	$29,660	0.6%	$30,268	0.4%
Interest payments	$1,644,402	33.4%	$2,684,816	33.1%
Principal payments	$1,458,753	29.6%	$3,098,122	38.2%
M&V costs	$173,370	3.5%	$334,046	4.1%
Non-M&V performance period expenses	$482,392	9.8%	$931,597	11.5%
O/M (site-performed)	$25,625	0.5%	$83,941	1.0%
Equipment salvage value	($119,968)	(2.4%)	($405,099)	(5.0%)
Total	**$4,922,607**		**$8,113,297**	

Cost breakdown for appropriations experience case

Expense	Constant dollar cost (PV)		Current dollar cost	
Process-related	$3,132	0.1%	$3,257	0.1%
Feasibility study	$792,827	14.3%	$834,064	13.5%
Design/construction	$2,961,622	53.5%	$3,518,844	56.8%
Excess energy	$1,663,588	30.1%	$1,953,397	31.5%
O/M	$407,578	7.4%	$888,988	14.3%
Salvage	($297,028)	(5.4%)	($1,002,986)	(16.2%)
Total	**$5,531,718**		**$6,195,563**	

Cost breakdown for “best case” appropriations

Expense	Constant dollar cost (PV)		Current dollar cost	
Process-related	$0	0	$0	0.0%
Feasibility study	$126,895	2.8%	$127,540	2.6%
Design/construction	$3,180,360	71.4%	$3,328,855	68.2%
Excess energy	$758,417	17.0%	$813,963	16.7%
O/M	$508,017	11.4%	$1,015,537	20.8%
Salvage	($119,968)	(2.7%)	($405,099)	(8.3%)
Total	**$4,453,720**		**$4,880,796**	

Observations

- Long delay in appropriations experience case means inefficient equipment remains in service longer
- Present value of energy/energy related O&M during this delay ($1.664 million) is about equal to the interest costs in ESPC case ($1.644 million)

Additional observations

- M&V costs associated with Super ESPC represent just 3.5% of the total life-cycle present value cost
- Project facilitation is a good value: costs represent just 0.6% of the life-cycle present-value cost of the Super ESPC

Is it lower LCC to wait for direct-funding? – Depends on what is spent on surveys/studies and how long you have to wait.

Total process time (months)	Total survey/study cost (as percentage of design completion/construction cost)										
	4%	6%	8%	10%	12%	14%	16%	18%	20%	22%	24%
28	0.8969	0.9099	0.9231	0.9361	0.9491	0.9623	0.9753	0.9883	1.0015	1.0145	1.027
30	0.9028	0.9160	0.9290	0.9422	0.9552	0.9682	0.9814	0.9944	1.0074	1.0206	1.033
32	0.9087				9	0.9739	0.9869	0.9999	1.0129	1.0259	1.039
34	0.9146				6	0.9796	0.9928	1.0058	1.0188	1.0318	1.044
36	0.9202				2	0.9855	0.9985	1.0115	1.0245	1.0375	1.050
38	0.9259				9	0.9909	1.0039				
40	0.9314				2	0.9962	1.0092				
42	0.9369				7	1.0017	1.0147				
44	0.9422				2	1.0072	1.0202				
46	0.9475	0.9605	0.9733	0.9863	0.9993	1.0123	1.0253				
48	0.9527	0.9655	0.9785	0.9915							
50	0.9578	0.9708	0.9838	0.9966							
52	0.9629	0.9759	0.9889	1.0017							
54	0.9678	0.9808	0.9938	1.0066							
56	0.9729	0.9857	0.9987	1.0115							
58	0.9775	0.9905	1.0035	1.0163							
60	0.9822	0.9952	1.0080	1.0210							
62	0.9871	0.9999	1.0127	1.0257							
64	0.9899	1.0027	1.0157	1.0285							
66	0.9944	1.0074	1.0202	1.0330							
68	0.9989	1.0117	1.0245	1.0375							
70	1.0031	1.0161	1.0289	1.0417							

Shaded cells – lower LCC with appropriations

White cells – lower LCC with avg. Super ESPC

Table shows ratios of LCC of a range of appropriations cases parameterized for total process time and survey/study costs to average Super ESPC LCC. Ratios less than 1 indicate appropriations

Conclusions

- **Appropriations are best value if:**
  - Congress appropriates without delay
  - Agency HQs disburse funds to field without delay
  - All studies lead to built projects
- **However, experience shows:**
  - Congress usually has higher priorities than energy projects
  - Agency HQ process to allocate funds to sites causes delays
  - High overheads (not all studies lead to built projects)

Conclusions (continued)

- When compared to appropriations based on actual experience, ESPCs represent a better value for funding energy conservation projects, saving about $600,000 in life cycle cost over the life of the typical project
- Obviously this study is not definitive, but the conventional wisdom may not be either